

## **CHARTER NATIONAL ENVIRONMENTAL RESEARCH PARKS**

A National Environmental Research Park is an outdoor laboratory where research may be carried out to achieve national environmental goals, as articulated by the National Environmental Policy Act (NEPA), the Energy Reorganization Act, the Department of Energy Organization Act, and the Nonnuclear Energy Research and Development Act. NEPA translated the public concern for a quality environment into environmental goals, and the National Environmental Research Parks network will provide land to help the Nation comply with the spirit of NEPA. The Energy Reorganization Act of 1974 mandates the Agency to engage in environmental research related to the development of energy sources so as to advance the goals of restoring, protecting, and enhancing environmental quality. The National Environmental Research Parks are actually field laboratories set aside for ecological research, for study of the environmental impacts of energy developments, and for informing the public of the environmental and land-use options open to them.

Because public access to DOE land is limited, environmental research projects can be carried out with a minimum of interference. Any land outside Restricted Areas may be made available by the field manager for study under site-use procedures. Some natural areas should be protected from all manipulations for definite or indefinite periods of time in order to serve as controls. While execution of the program missions of DOE sites must be ensured, ongoing environmental research projects and protected natural areas must be given careful consideration in any site-use decisions. Where appropriate, research parks may be established with other governmental agencies in interagency agreements.

A wide range of research and demonstration programs will be necessary to systematically address the environmental impacts of human activities. Research parks are not simply sites to conduct research, but have environmental research programs planned to address these general objectives: (1) to develop methods to quantitatively and continuously assess and monitor the environmental impact of human activities, (2) to develop methods to estimate or predict the environmental response to proposed and ongoing activities, and (3) to demonstrate the impact of various activities on the environment and evaluate methods to minimize adverse impacts.

Research park programs will be unique at every site, varying in the ecological and energy-related problems addressed and in the participation of researchers who are not funded by the Department.

## **PROGRAM DIRECTIVES FOR THE NATIONAL ENVIRONMENTAL RESEARCH PARKS PROGRAM**

The network of research parks was formally established with an insightful statement of objectives organized in three broad categories: (1) to develop methods to quantitatively and continuously assess and monitor the environmental impact of human activities; (2) to develop methods to estimate or predict environmental responses to these activities; (3) to demonstrate the effects these activities have on the environment and evaluate methods to minimize any adverse effects.

### **1. Assessment and Monitoring**

- a. Compile a regional environmental encyclopedia, including species lists, characterization of ecosystems, successional stages, and maps of the vegetation, soils, hydrology, etc. Species characterizations should include population levels, life histories, and the sensitivity to environmental stresses in terms of behavior, physiology, genetics, reproduction, and productivity. Special attention should be given to endangered and threatened species.
- b. Set aside and characterize research reference areas. To assess the environmental effects of site activities and ecosystem change brought about by stresses, certain minimal representative and/or unique natural areas must be left undisturbed.
- c. Establish field and laboratory repositories. Reference areas should be set aside to serve as gene reservoirs for organisms common to the region and to allow a wide range of genetic diversity to be retained. Genetic diversity is a natural defense against the vulnerability to epidemics that tend to develop in plants and animals intensively selected for yield or utility. Sites representing the "regional" deposition of air- or water-borne pollutants, not subject to ground-level redistribution, should be preserved and protected from contamination.
- d. Serve as environmental data centers and ultimately as regional environmental clinics for a particular ecoregion of the United States. As data storage and retrieval systems are developed and each park inserts strong cadres of researchers, DOE has the capacity to establish data centers for regional information, retrieval, assessment, and dissemination.
- e. Supply basic data so that national environmental decisions, standards, and monitoring programs can be developed using a firm ecological base. A regional monitoring network should be established and operated so that ecosystem responses can be continually monitored and evaluated with full meteorological information.
- f. Development and improve ecosystem analysis techniques. Current techniques for conducting ecological surveys, inventorying populations, and measuring ecosystem responses to stresses should be tested and improved upon. Techniques should be developed to assess the general health of ecosystems relative to energy flow, materials cycling, species diversity, community structure, and stability.

- g. Manipulate ecosystems in carefully designed experiments by applying various environmental stresses, then assessing the ecosystem responses.
- h. Participate in international environmental programs to contribute to the assessment of human effects on the global environment and to cooperate in improving environmental quality.

## **2. Prediction**

- a. Develop mathematical models simulating ecosystems to predict organism response to environmental stimuli, organize knowledge about the system, and select research priorities. The flow of energy, population dynamics, and the cycling of water and nutrients should be included in these models. The accuracy and geographical transferability of these models should be validated.
- b. Identify organisms, organ systems, and ecosystem components that can serve as indicators of environmental quality.
- c. Develop techniques to predict the ultimate location and deposition of specific pollutants, particularly those techniques allowing estimates of organism effects when full life history and physiological characterizations are not known.
- d. Study the interactions of pollutants and environmental conditions. Synergistic effects may be unlike suspected effects of single pollutants, consequently predictions of ecosystem and organism responses to pollutants depend on the interactive effects.
- e. Study the pathways and sinks of pollutants in the environment and their spheres of influence. Predicting the ecosystem and organism response to a pollutant entering the environment necessitates determining the ultimate disposition of the pollutant and any organism or ecosystem components that it affects.
- f. Serve as a site for successional studies. Environmental insults such as fire, logging, radiation, and thermal effluents continue to affect the environment over time. The rates of secondary succession and/or recovery from such events should be evaluated and used as a basis for determining the optimal rate of resource exploitation.

## **3. Demonstration**

- a. Serve as a public demonstration area where citizens and specialists can observe long-term effects of specific factors and the true costs of alternate options for waste management or other land uses. Where feasible, research parks should offer an extension service to community groups, providing lectures, tours, and a visitors' center.
- b. Capitalize upon the ecologists at the research parks and develop a core curriculum training program outside or in conjunction with a neighboring university.
- c. Demonstrate alternate uses of land. Techniques should be developed for translating ecological costs of energy-related activities into economic costs.